Interdisciplinary research at the Philadelphia social history project: analytic goals, data and data manipulation strategies for the study of the nineteenth-century industrial city

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Introduction

The QUANTUM-SSHA Conference is part of a larger process characterized by twin shifts among scholars on a world-basis. Electronic data processing, while not necessarily a part of the new scholarship, served as a catalyst and the widespread availability of this technology today no doubt underlies and accelerates the changes taking place. Historians are moving beyond impressionistic approaches and evidence to rely upon processed-produced data and social science methods and analytic techniques, while social scientists are moving beyond correlation and contemporary cross-sectional analyses to use time-series data and historical perspective in their research. This happy state of affairs is long overdue and we hope that the momentum can be sustained.

Not only has the new and powerful computer technology facilitated these transformations, but it places before us the opportunity to create a genuinely new form of research that is at once interdisciplinary, collaborative and historical. I emphasize that we have before us a possibility, not a certainty. As the last fifteen years of research in the United States makes clear, the mere use of quantitative data and methods will not lead inexorably to the successful establishment of this new research form. To create a cooperative and cross-disciplinary research organization, we will have to work consciously and deliberately toward bridging the gaps that separate the disciplines. This requires the integration of the disparate theories, con-

[1] The Philadelphia Social History Project (PSHP) is directed by Theodore Hershberg, Associate Professor of History and Public Policy. PSHP gratefully acknowledges the support it receives from the following agencies of the U.S. federal government: Center for Studies of Metropolitan Problems, National Institute of Mental Health (MH 16621); Sociology Program, Division of Social Sciences, National Science Foundation (SOC 76-20069); Division of Research Grants, National Endowment for the Humanities (RO 32485-78-1612); Center for Population Research, National Institute of Club Health and Human Development (HD 17413).

cepts, methods, techniques and knowledge created by the separate disciplines that bear upon common subject matter, but which over the years have been artificially segregated from each other.

The difficulty of this pioneering task is exceeded only by its importance. In meeting the challenge that it poses, we must keep clear in our minds that research ends and means are not unrelated, that the findings are themselves very much dependent upon the manner in which research is organized. While the experience of the Philadelphia Social History Project (PSHP) over the last nine years can be offered now as a successful model for emulation where the collection and processing of data and cooperation of scholars from different disciplinary backgrounds are concerned, it is still too early in our data analysis stage to claim that we have also mastered the many aspects of genuine interdisciplinary research. It is not clear that we have even identified, let alone resolved, the problems of organization and interpretation associated with such an approach to knowledge. Nevertheless, we have learned a good deal, perhaps enough to offer our experience as an encouraging though tentative beginning whose progress should be watched. It is our hope to share the details of this experience so that our mistakes can be avoided and our success learned from. Researchers associated with the PSHP are identified in Appendix I, a bibliography of PSHP research appears in Appendix II, and the machine-readable data base that supports our research is described in Appendix III.

The version of this paper presented to the Cologne Conference included a section, „Interdisciplinary Historical Research in the United States: Problems and Possibilities." This section has been removed from the current essay for the sake of brevity; however, readers can find a fuller discussion of these issues elsewhere[2]. In this paper, I will summarize my views on the importance of an interdisciplinary approach for urban historical research and discuss how research at the PSHP is organized: our data base, whose scope and detail makes possible the interaction of scholars from separate disciplines; several of the analyses such a data base sustains; and a variety of data manupulation techniques that make good on the quip that „the whole is greater than the sum of its parts".

[2] See the introductory chapter of Hershberg, Theodore (ed.), Toward an Interdisciplinary History of the City: Work, Space, Family and Group Experience in Nineteenth-Century Philadelphia, Oxford University Press (forthcoming 1979–1980). This volume contains a selection of PSHP papers that report substantive findings from the first round of research. The origins and methodological development of the PSHP are detailed in Hershberg, Theodore, The Philadelphia Social History Project: A Methodological History, Doctoral dissertation, Stanford University 1973; and Hershberg, T., guest editor, A Special Issue: The Philadelphia Social History Project, in: Historical Methods Newsletter, 9, No. 2–3 (March–June 1976).

The Organization of Research: The Need for an Interdisciplinary Approach

The argument offered is simple: a fundamental relationship exists between how knowledge is sought and the nature of the learning obtained. The ways in which we organize to conduct our research have a necessarily profound impact on what we are likely to find. This relationship owes its power to the revolution in the sociology of knowledge that has characterized the past century.

Guided by theories, concepts and methods developed in increasingly distinct and specialized disciplines, scholars expanded the frontiers of knowledge with great rapidity. By the end of the nineteenth century, scholarship had been organized in the major disciplines around which most unniversities are still structured; each discipline organized nationally and internationally in professional associations and generated a professional community of discourse of its own. The „Renaissance Man" may have remained the ideal for undergraduate education, but he had been discarded, by the twenthieth century, as an unacceptable model for the new professional, specialized research scholar[3].

This reorganization of knowledge produced extraordinary progress, of course, but it has not been an unmixed blessing. Indeed, in important respects, professional specialization has progressed to the point of diminishing societal returns. The staggering amount of knowledge generated can barely be digested within a given isolated field, much less be made visible to others. As philosopher Stuart Hampshire recently pointed out, discussing the consequences of proliferating but unintegrated and undigested knowledge, „if we do not know what we know, then our first order knowledge is apt to be unused, almost if it did not exist"[4]. Even more seriously, disciplinary boundaries have tended to become barriers preventing us from seeing the contours of enormously complex problems in a real world that resists compartmentalization. Interdisciplinary effort can thus become not simply desirable for maximizing integrated knowledge, but an absolute necessity if problems are to be correctly understood and engaged.

This problem of fragmented knowledge and narrow disciplinary boundaries has long been recognized by students of the city; indeed, urban problems are perhaps the most frequently cited illustration of the more general necessity of interdisciplinary study. „The city is too complex a world to be understood from a single vantage point alone . . .", noted Richard Wohl in a characteristic statement. „The full dis-

[3] Bledstein, Burton, The Culture of Professionalism, New York 1976; Kuklick, Henrika, The Organization of Social Science in the United States, in: American Quarterly, 23 (Spring 1976), pp. 124–141; Haskell, Thomas L., The Emergence of Professional Social Science: The American Social Science Association and the Nineteenth-Century Crisis of Authority, Urbana 1976.

[4] Hampshire, Stuart, The Future of Knowledge, in: New York Review of Books, 24 (March 31, 1977), p. 14.

covery of what has passed in a city's history can only be called forth by cooperative, interdisciplinary inquiry." „To study the city", Allen Davis argued, „means to cut across the artificial lines of departments and disciplines". And Theodore A. Brown concluded with some frustration that „there is no sense in which I can pursue studies in city history as a practitioner of a self-sustained ‚discipline' called history . . . if the approach is worth anything at all it needs a great deal of reinforcing from other so-called disciplines"[5]. Virtually every survey of urban history in the last two decades has come to precisely the same conclusion[6].

But given this unanimity, the record of actual achievement in interdisciplinary work is disheartening. Social scientists and historians have been unable to generate

[5] Wohl, R. Richard, Urbanism, Urbanity, and the Historian, in: University of Kansas City Review, 22 (Autumn 1955), p. 57; Davis, A. F., The American Historian vs. The City, in: Social Studies, 56 (1965), p. 134; Wohl, R. Richard, and Brown, A. Theodore, The Usable Past: A Study of Historical Traditions in Kansas City, in: Huntington Library Quarterly, 23 (May 1960), pp. 237–259.

[6] No useful purpose can be served by presenting further testimony. Suffice it to say that all surveys of the urban history field, most notably those by Eric Lampard, Charles Glaab, Charles Tilly and Roy Lubove have made the same point. Lampard, Eric E., American Historians and the Study of Urbanization, in: American Historical Review, 67 (October 1961), pp. 49–61; Glaab, Charles N., The Historian and the American City: A Bibliographic Survey, in: Hauser, Philip M., and Schnore, Leo F. (eds.), The Study of Urbanization, New York 1965, pp. 53–80; Tilly, Charles, The State of Urbanization, in: Comparative Studies in Society and History, 10 (October 1967), pp. 100–113; Lubove, Roy, The Urbanization Process: An Approach To Historical Research, in: Journal of The American Institute of Planners, 33 (January 1967), pp. 33–39; at least at the level of rhetoric, such sentiments are shared by scholars in disciplines other than history. For example, one of the four major recommendations made by the Social Science Research Council's Committee on Urbanization was „to work towards the advancement of multidisciplinary research in the process of urbanization". Hauser, Philip M., Urbanization: An Overview, in: Hauser, The Study of Urbanization, p. 41.

Sentiments of this nature were voiced not only by American urban historians, but by their European colleagues as well. The Study of Urban History, New York 1968, a widely respected collection of essays by scholars in Great Britain edited by A. J. Dyos, was filled with calls for cooperation across disciplinary lines; similar appeals regularly appear in the French journal Annales; and scholars in the Scandinavian countries have also supported the idea of interdisciplinary research. See also a special edition of Annales devoted to research on the city (1970), especially the remarks of O. Zunz; for work in Norway, see Langholm, Sivert, The Ullenshaker and Kristiania Projects at the University of Oslo, QUANTUM-SSHA Conference (Cologne, August 10–12, 1977); for work in Sweden, see Agren, Kurt, et al., Aristocrats, Farmers, Proletarians: Essays in Swedish Demographic History, Uppsala 1973; also see Öhngren, Bo, Folk: Rorelse: Samhallsutveckling, Flyttnings-monster Och Folkrorelser: Eskilstuna, 1870 to 1900, Uppsala 1974. For earlier work in Sweden, see the results of the conference organized by Carl Goran Andrae (Uppsala June 1973) and reported in a special issue, History and the Computer, in: Historical Methods Newsletter, 7, No. 3 (June 1974), p. 3; an extraordinary effort with enormous analytic potential is now underway to make machine-readable masses of historical information covering the development of Stockholm over a 300 year period; see Gustafson, Uno, Demographic Data Base Stockholm, Stockholm Stadsarkiov 1977.

new modes of research organization, whatever their commitment to the ideal of a new interdisciplinary scholarship. Consider the inadequacies of the usual responses to the call for innovation. There is first of all the interdisciplinary conference. Useful exchanges result and anthologies are often produced, but subsequent research remains fragmented. Second is the response of the individual scholar who strives to absorb the relevant literature of ancillary disciplines. The noble intention is one inevitably doomed owing to the limitations of what any individual can accomplish. The dilemma is a profound one, for as Lawrence Stone has observed, „to ignore the contributions of the social sciences is clearly fatal; to master them all, or even any one, is clearly impossible"[7]. Finally, in recent years, we have seen a proliferation of interdisciplinary studies programs (black, women, ethnic, etc.) and pan-professional associations. But undergraduate course sequences are not capable of sustaining active cross-discipline research, and pan-professional organizations (the Social Science History Association is the most recent example) measure and stimulate interest rather than implement such efforts. All of these responses, in short, facilitate consumption, not production of new approaches. They do not provide mechanisms for truly integrating the disparate research they encourage. They sustain interdisciplinary communication, but not interdisciplinary process.

The failure to accomplish more than this despite laudable intentions is not accidental. It is traceable, rather, to a combination of *structural factors* – the system of hiring and rewards governing the organization of research in universities – and *cultural factors* – that set of values sanctifying individual accomplishment while deemphasizing the collaborative efforts necessary to form the organizational base for interdisciplinary research[8]. Whereas researchers in the „hard" sciences are accustomed to working collaboratively across disciplines, and assume the importance of systematically expanding knowledge built on the base of previous research, in the humanities emphasis has been on originality and creativity, often purchased at the expense of cumulative scholarly advancement.

The challenge is thus to develop mechanisms capable of transcending both structural and cultural obstacles in the humanities and social sciences, mechanisms that will have to work, moreover, without the integrating power that precise applied research has developed in the hard and policy sciences. An integrating mechanism of a different sort must be found.

Urban research remains the best ground on which to construct such a mechanism. As A. J. Dyos has pointed out, „There is a widening awareness of the possibility . . . that in the study of the way in which urban society has organized itself spatially and structurally and has developed such a variety of social systems, there exists an incomparable arena in which to bring together more explicitly a number of these

[7] Stone, Lawrence, History and the Social Sciences in the Twentieth Century, in: Delzell, Charles E. (ed.), The Future of History: Essays in the Vanderbilt University Centennial Symposium, Nashville/Tenn. 1977, p. 19.

[8] See Hershberg, Theodore, The Organization of Historical Research, in: AHA Newsletter, (October 1976).

converging disciplines". Such a focus „lends itself so well to fruitful exchanges among the disciplines", O. D. Duncan and Leo Schnore accurately observed, „because of its strong empirical base and its relatively concrete view of society"[9].

The experience of the PSHP suggests that it is possible to construct and operationalize the needed mechanism. A common data base that includes both ecological and behavioral information about the city serves as the necessary facilitating device, and computer technology and the methodologies developed to manipulate the data can support the efforts of scholars trained in separate disciplines to integrate their knowledge about the city. Such an approach provides a working model of an interdisciplinary structure, and, even more, a collaborative and interdisciplinary research culture. To be sure, formidable obstacles face those who would emulate this approach, and the current financial crisis makes it clear that solutions may have to be found in crossinstitutional and perhaps regional and national cooperation as well. The technology of electronic data processing will support these efforts.

Historians studying the sociology of knowledge understand the relationship between organization and scholarship; it is time to apply such a critique to the present structure of research. To ignore it further dooms us to continued frustration. Unless new institutional mechanisms are developed to support interdisciplinary collaborative research, our knowledge about cities will remain hopelessly fragmented.

A Common Data Base

Unlike interdisciplinary conferences or pan-professional associations that facilitate important discussion and exchange of ideas, a common data base actively shared makes it possible for researchers to implement in actual research activities the expertise developed in their respective disciplines. Beyond shared working and office space, prolonged use of the same data and criss-crossing perspectives on many of the same questions operate to break down barriers to communication. Daily contact and discussion ensure that disciplinary jargon gives way to a vocabulary that can be understood by all researchers. While common questions, common problems, and

[9] Dyos, H. J., Agenda For Urban Historians, in: Dyos, The Study of Urban History, p. 4; Duncan, Otis D., and Schnore, Leo, Cultural Behavioral and Ecological Perspectives in the Study of Social Organization, in: American Journal of Sociology, 65 (September 1959), p. 145. Different disciplines assign different meanings to the term „behavior". As used by sociologists Duncan and Schnore, „behavior" refers to the realm of the attitudinal; as used by social historians (and in PSHP research) „behavior" refers to human actions – to what people did. Studies of behavior by social historians thus include fertility, marriage, occupational and residential mobility, mortality, etc.

even a common research site can *bring people together*, a common data base makes possible the integration of their efforts. The alternating use of the same data as dependent and independent variables, the ability to conduct research using common categorization schema and specific measure values, and the opportunity to formulate hypotheses drawing upon information normally outside the standing disciplinary paradigm – all of these operate in support of successful interdisciplinary collaboration. It is not that these things *cannot* be undertaken in research unsupported by a common data base, but that they rarely occur because of so many intellectual and logistical barriers.

The machine-readable data base of the PSHP consists of the following sources for Philadelphia County in the years 1850, 1860, 1870 and 1880. Each data set described below is further detailed in Appendix III.

(1) *Population Manuscript Schedules of the U. S. Census:* These schedules are by now a familiar part of the new social history in the United States. Our efforts commenced with the conversion of 100 rolls of microfilm to hard copy, an expense that has proved its value many times over. We now have 58,000 pages containing information describing each of the 2.5 million persons who lived within the county at the time of the four decennial enumerations (name, age, sex, race, occupation, property, place-of-birth, etc.). Extensive sub-sets of this information were converted to machine-readable form. Philadelphia was America's second largest city in these years with a population of 845,000 in 1880. When geographic location is added to these data, it is possible to examine a wide array of socioeconomic, demographic and spatial topics.

(2) *Manufacturing Manuscript Schedules of the U. S. Census:* Not as well-known as the population manuscripts, the information contained in these documents – product type, capital investment, wage levels, number and sex of employees, type of mechanization, and the kinds, quantities and values of raw materials and finished products – makes possible the detailed study of the city's industrial base and industrial geography as they underwent significant structural transformation. All the information in the schedules describing 29,000 *individual* firms were converted to machine-readable form. Throughout the period, Philadelphia's economy was highly diversified, it had a significantly disproportionate share of total U. S. manufacturing output, and it was among the world's leading centers of industry.

(3) *Business Directories:* Published on a yearly basis in most American cities throughout most of the nineteenth century and into the twentieth century, the business directories listed alphabetically by products sold or services offered the names and street addresses of all subscribers. Roughly 140 000 firms advertised in Philadelphia's directories in the four years indicated above. These data permit a wide variety of uses. They provide spatial information otherwise unavailable; they can be used to examine the degree of turnover across business types and areas of the city; they tell us some vital things about the non manufacturing sectors of the economy; and they constitute the best single source of information to reconstruct the range of shops, services and institutions throughout the city and are hence invaluable for micro-level study of neighborhoods or given areas of the city.

(4) *Transportation Facilities:* The exact routes followed by all horse-drawn street cars as well as passenger and freight railroads were converted to machine-readable form. The horse-car system emerged in the late 1850's when iron rail was laid in the streets of the city; because of significant friction reduction, three-to-four times as many passengers could be hauled by the horse-cars than was possible with the urban stagecoach which operated over cobblestone and dirt roads. By 1880, some 99 million passengers rode across the city's 300 miles of track. The system was not replaced with electrified trolleys until the mid-1890's. These data play an important part in the overall research, enabling us to break into the „chicken and egg" relationships between transportation and the city's residential, industrial and commercial expansion. Transportation led the way in all of these and played a vital role in the larger process of the differentiation of urban space.

(5) *Public and Private Institutions and Associations:* Collected for the same years as the decennial census surveys and usually found in city directories, newspapers and other listings, the names and addresses of these public and private, religious and secular institutions and voluntary organization meeting sites were converted to machine-readable form. Along with other information described above, they permit the reconstruction of the urban environment in rich detail and enable us to differentiate among the wide variety of neighborhoods and other specialized sections of the city.

(6) *Death Registers:* The 19,000 deaths that occured between July 1, 1880 and June 30, 1881, were converted to machine-readable form. They contain valuable information describing the deceased (name, age, sex, race, marital status, occupation, birthplace, address, date and cause of death, attending physician, place of burial) (Appendix III). These dates were selected because they followed immediately upon the enumeration of the population census in June, 1880. The information contained in these documents enables us to study how death brought on by different causes varied not simply across age and sex, but according to ethnicity, occupation, neighborhood and seasonality. When linked back to the population schedules, we can arrive at estimates of accuracy in the respective documents and make important adjustments in the base population figures necessary to calculate death rates; the linkage also makes possible the examination of the household and family context just prior to death. When associated with all other PSHP data, the different kinds of death can be correlated with the full range of ecological variables[10].

(7) *Areal Units as a Common Denominator:* All PSHP data have been coded for geographic location within the 130 square miles of Philadelphia County. With an area so large, it becomes possible to conceptualize the city as a metropolitan region, containing the City of Philadelphia and many outlying communities all found within the county. The spatial system devised is essentially a grid network emerging from a series of vertical and horizontal lines drawn at fixed intervals over the map

[10] The research on mortality will be supported by a grant from the Center for Population Research, National Institute of Child Health and Human Development, Theodore Hershberg and Gretchen Condran co-principal investigators.

of the county. Of a total of roughly 7,000 grid units, each 660 by 775 feet, some 1,000 were inhabited in 1850 and 2,000 in 1880. There is no „ideal" areal unit – different analyses require different size inits. In many instances, we aggregate up from the grid level which reduces the number of areal units from several thousand to several hundred. The PSHP grid unit – small, unchanging over time and not drawn by politicians – has sustained a wide variety of analyses. As will be elaborated below, the use of common spatial codes makes it possible (through a variety of data manipulation techniques) to create a series of machine-readable records containing an infinite combination of variables with which to study simultaneously and systematically the relationships between individual-level behavior and ecological setting.

The Evolution of Analytical Goals

Today it is possible to describe the central concern of the PSHP as the deepening of our understanding of the micro-level causes and consequences of urbanization and industrialization. Our earliest efforts were far less broad and their evolution was inextricably bound up in the expansion of the data base and the involvment of scholars from disciplines other than history. The research began in 1969 as a study of comparative social mobility among blacks, Irish and German immigrants who lived in nineteenth-century Philadelphia. The initial data collected were drawn from only the population manuscript schedules and described the personal attributes of the masses of ordinary people. Yet, despite the richness of the information made machine-readable and the power of computer technology to manipulate and assist in the analysis of these data, it became obvious that further information was required if the larger urban-industrial context in which these groups of people lived was to play an active explanatory part in the research. Considered alone, the population data confine the „city" to a passive role – „urban as site" rather than „urban as process"[11].

The social mobility studies undertaken by American historians in the last decade or so provide a collective example of the „urban as site" approach. Working alone with limited resources and the tools of a single discipline, they used data drawn

[11] For an elaboration of this distinction and a critique of the „New Urban History" in the United States, see Hershberg, Theodore, The New Urban History: Toward an Interdisciplinary History of the City, in: Journal of Urban History, 5 (November 1978). For a Discussion of „Urban as Process", see Hershberg, Theodore, et al., ATale of Three Cities: Blacks and Immigrants in Philadelphia, 1850–1880, 1930–1970, for a special issue on Race and Residence in American Cities, in: The Annals, 441 (January 1979), pp. 55–81.

only from the population census schedules or city directories. They treated geographic and career mobility as their only dependent variables and used age, occupation, place of birth, property holding and other of the individual's personal attributes as their only independent or explanatory variables. The impact of urbanization and industrialization upon either the structure of employment opportunities or the rates or patterns of mobility, therefore, could not be directly or systematically assessed. Adding new data that described the city's industrial base and geography, its commercial and transportation facilities, and its public and private institutions made it possible to learn systematically how micro-level behavior and the urban environment interacted and how group experience was differentially affected. While only social historians were interested in the initial research, the addition of the new data attracted pre- and post-doctoral scholars from a variety of social science backgrounds. They represented economics, sociology, demography and geography and they brought with them the invaluable expertise for the study of the city developed in their respective disciplines. In other words, our experience followed this sequence: learning how the urban-industrial environment affected behavior required new explanatory variables; this necessitated the expansion of our data base; and once the date base expanded, we found that many social scientists wished to work along with us.

With input from the social scientists, the conceptual, methodological and technical tools became available that enabled us to treat the city in a dynamic fashion. The passive quality inherent in treating the city as an incidental setting for the study of behavior was replaced by a concrete view which saw the city as having particular form and substance that both affected and was affected by the people within it. Thus it is now possible to identify two, rather than only one, basic perspectives in our overall research design. Some PSHP researchers, drawn largely from the social sciences, treat the city as a dependent variable; they ask how the urban environment evolved, what it consisted of at given points in time, and how it changed under the impact of industrialization. A second group of PSHP researchers treat the city as an independent variable; they ask how aspects of the urban environment affected a wide range of behaviors, processes and attitudes. How did the city affect birth, marriage, family and death? What was the impact of the urban environment on migration, occupational and residential mobility, associational membership, social structure and the distribution of wealth? How were the processes of social mobility, assimilation, socialization and the development of political and class consciousness, values and personality affected by an urban-industrial setting?

From these distinct, but closely inter-related perspectives, four substantive areas of research have emerged: (1) the Nature of Work; (2) the Uses of Urban Space; (3) Developments in the Life Course; and (4) the Experience of Special Population Groups. The first of these explores the city's economy (particularly the composition and development of its industrial base), the composition of the labor force, the changing nature of the opportunity structure and the rates and patterns of career mobility. The second is concerned with the process by which the city was transformed from a geographically compact and heterogeneous mercantile center to a

sprawling and functionally distinct industrial city with growing divisions in land use for business and industry and segregation in residence along class, race and ethnic lines. The third area permits the large-scale phenomena with which we are concerned to be conceived of as the aggregate result of individual level decisions and events. These can be understood by focusing attention on the timing and sequencing of basic points in the life cycle: leaving school, leaving home, entering the workforce, getting married, becoming a household head, having children, moving to another neighborhood. All are inter-related and linked to the urban-industrial process through the family economy. Finally, the fourth area alters focus from processes that affect the entire population to the experience of particular groups. Here we examine how the urban-industrial experience affected important classes of people: blacks, Irish, Germans; the poor, welfare recipients and criminals; the new industrial elite and the aristocracy of labor; and women. Thus we learn how important human behavior — holding constant the urban-industrial setting — was mediated by the four major differentiators of experience: race, ethnicity, class and sex.

The Significance of Data Manipulation in a Large Data Base

The utility of a large data base for interdisciplinary research comes not simply from the number of cases found in a given data set (though this is an advantage when, for instance, one examines four- or five-way tables), but from the number of data sets describing distinct characteristics of the larger whole being studied. It is not that there were thousands of individuals in Philadelphia and only hundreds in other settings, but that in addition to information describing these people there were data describing their families, neighborhoods, institutions, the local economy, transportation facilities, public and private services and the like. In other words, it is not the *length* of a given file, but the *breadth* of the entire research context that makes a data base sufficiently broad and detailed for interdisciplinary research. Such a data base enables us to move beyond static cross-sections and disconnected pieces of the urban experience that have necessarily characterized so much of previous urban historical research. The PSHP data base makes it possible to begin to see the *simultaneity*, the complex feedback loops, and the unanticipated consequences that issue from change in a given corner of the urban system. With the construction of the requisite research environment comes the ability to see — and thus raises the likelihood that we will understand — the interplay of personalities, political decisions, major events, institutional behavior and impersonal, socioeconomic and demographic forces. When research is approached in such a manner, it is likely that one's sense of causality will be radically altered as well, an inevitable consequence of seeing urban complexities more wholly.

In such a data-rich environment, data manipulation assumes a critical role. A computer-based research project may be divided into three distinct phases. The first is „Data Collection, Processing and Verification". The last is „Data Analysis and Display". „Data Manipulation" is the intermediate stage generally involving the creation of new variables, the modification of file structure, and the aggregation of data within a file or the combination of data from different files to form new records. In a flow chart, data manipulation would stand between source files and statistical packages or mapping routines. Researchers who believe that they will be able to undertake analysis immediately after completing data verification — that is, after making certain that the conversion process has accurately transformed information from the historical source document to machine-readable form — are either in for a shock and considerable delay or they have quite limited data sets and narrow analytic concerns. When the research design is sophisticated and several large data sets are involved, data manipulation becomes a major challenge, often requiring the preparation of extensive new software specifically designed to perform a variety of data transformations.

My purpose in this section is not to elaborate fully on the data manipulation stage, but to identify two generic procedures within this stage that have the effect of making the whole greater than the sum of its parts. That is to say, that by combining the data sets in certain ways, researchers can undertake analyses not possible with the data in their original machine-readable form. The two procedures are record linkage and the summary of information by ecological unit.

Record Linkage

The first of these is familiar to researchers engaged in studies of career and geographic mobility, and involves the identification of the same person in two or more separate files (without, of course, knowing in advance who these matched pairs will be). In the mobility studies, this procedure has almost always been an „over-time" identification. The PSHP does record linkage over time not only of individual persons, but of individual families, business and manufacturing firms, and institutions. One of the sessions at the conference was devoted to this important topic.

However, I would like to explain the benefits that result from record linkage done for purposes other than longitudinal analysis: the identification and combination of records referring to the same persons, families, firms and organizational memberships across different data sets at the same point in time. While each data set was collected for specific analytic concerns that could be carried out without linking it to other data, when so combined they permit new and important analyses that could not be conducted working with each data set alone. Below are several brief examples of such data manipulation being undertaken at the PSHP.

(1) *City Street Directories to the Population Manuscript Schedules:* The population manuscript schedules did not include specific address until 1880. If the city street directories (which listed persons alphabetically by surname along with occu-

pation and street address) are machine-readable, then an automated record linkage program can be used to match persons found in both sources. In this operation, both name and occupation can be used to make positive identification without biasing results. Thus, drawing upon the socioeconomic and demographic information reported in the population census, the residential patterns of the city can be reconstructed and analyzed at the block or grid rather than at the ward level (with important benefits for subsequent longitudinal analysis because, unlike ward boundaries, the smaller areal units do not change over time).

(2) *Manufacturing Schedules to Business Directories:* The manufacturing manuscripts did not include street addresses for each firm and in 1880 they failed to report even ward number as had been the case in the earlier enumerations. Yet, with few exceptions, firms employing more than ten workers advertised their location in the city's business directories. Our automated record linkage program was used to match firms found in both sources. Thus it has been possible to undertake a series of detailed analyses of industrial geography and its significant relationships to a host of topics including residential patterns (which were dictated to a major extent by the locational decisions of manufacturing firms) and the „journey-to-work".

(3) *The Journey-to-Work: Joining the Population and Manufacturing Schedules:* By overlaying the location of jobs (described in (2)) on the distribution of workers' residences (described in (1)), we were able to construct the labor shed parameters from which firms drew their employees and hence to derive the dimensions of the journey-to-work. In 1850 and 1880, respectively, 90 percent of the work force lived within four blocks (the median distance was two blocks) and within one-mile (the median distance was one-half mile) of the firms in which they worked. These results came from matching the industry-type coded for each firm in the manufacturing census with the same industry-type coded for each person's occupation in the population census. Using proximate spatial location and agreement in industry-type, it was possible in the absence of employee lists (only the number and sex of workers rather than actual names were reported in the manufacturing census) to associate specific people with the firms in which they were likely to have worked. The information describing industrial setting (e. g., the kind of firm – big or small, with or without mechanization, capital or labor intensive, etc.), can now be used, for example, as independent variables to explain the occupational mobility of individual workers.

(4) *Business Directories to Population Census:* When the business directories are linked to the population schedules, it becomes possible to study the socioeconomic and demographic characteristics of professionals, proprietors and craftsmen within the areas of the city in which they made their living. For instance, who were the owners of shops in the immigrant and black sections of city? More importantly, however, the study of the occupational universe, especially its stratification, is brought into far clearer focus. All studies of occupational structure and mobility – for that matter, the many studies that use occupation as a proxy for class or socioeconomic status – have been severely hampered by the limitations of the occupational data as reported in the population census. Significant numbers of ambiguous

job titles cannot be accurately assessed and coded. Does „liquor store", for example, refer to the proprietor, the clerk or the clean-up man? Does „carpenter", „baker", or „tinsmith" refer to the master craftsman or to the journeyman? When linked to the business directories, we are able to differentiate among these, to identify the proprietor and the master craftsman. We are thus in a position to classify the nineteenth-century occupational universe in terms far more relevant to it than is possible using the ahistorical stratification schema imported wholesale from contemporary sociological research.

(5) *Manufacturing Schedules to the Population Census:* Since incorporation required an act of the state legislature until 1875, the name of the manufacturing firm is almost invariably the name of its owner. When these people are traced to the population schedules it becomes possible to analyze variation in the industrial sphere in terms of the socioeconomic, demographic, and residential characteristics of the individual owners. For example, we can determine the origins of the new industrial elite: were they drawn from the ranks of the old commercial and native-born classes, from old handicraft manufacturing or from the ranks of the foreign-born and newcomers? Here is a quite distinct focus on the openness of the opportunity structure in nineteenth-century America. In the same manner, we can learn the background from which were drawn the owners of firms that produced capital or consumer goods, characterized different sectors of the economy, used mechanized production techniques, employed women and children, paid high or low wages, and so on down an even richer list when these categories are combined with each other.

(6) *Organizational Lists to the Population Schedules:* The PSHP is also making machine-readable extensive numbers of membership lists for a wide range of organizations: church-related, trade unions, political, self-help, leisure and literary. Work already completed for the black population (4 percent of the city's population), turned up 4,500 memberships, held by 3,000 persons, in 200 organizations. The stated purposes and prevailing types of organizations themselves provide important insights into the values, interests and needs of particular groups of people (differentiated by race, ethnicity, class and sex). When these lists are linked to the population census closest in time to the date of membership, however, it is possible to undertake a far reaching set of analyses. With new machine-readable files describing the socioeconomic, demographic and spatial characteristics of individual members, we can compare the profiles of members to non-members, of members and leaders across organizations, and of membership patterns over time. Thus we can infer a good deal about group values and attitudes; and when controlling for race, ethnicity and sex, we can explore the significance of socioeconomic class in determining internal group stratification.

Information Summarized by Ecological Unit

The second generic type of data manipulation in a large and diversified data base requires the creation of a summary record for each ecological unit. The one piece of information common to all PSHP data is location in physical space, using as a coding category the roughly block square grid that serves as the project's basic areal unit. Such an effort involves not simply the combination of data from different files, but most frequently their transformation by aggregation to the level of the desired areal unit (a grid or combination of grids). Thus we can create a record that in some respects resembles (but is richer than) a contemporary census tract with an almost infinite number of variables drawn from the different PSHP source files.

The new records can be created in three basic ways: on an *ad hoc* basis; as a fixed set of predetermined variables; or by use of a generalized computer program that can be run and re-run. The first of these alternatives is the least desirable: it would require a considerable amount of computer programming each time a new areal summary file was created; it would make researchers who do not do their own computer programming always dependent on those who did; and it would be very expensive because it would be redundant. The second alternative would be relatively inexpensive, requiring only one long pass through all the files; but it would leave no room for change. This approach would be unable to accommodate the creation of new variables that emerge from ongoing research or that are required to answer new questions. The last alternative is the most attractive, though it, too, is initially very costly in software design and coding. Once available, however, it would enable any researcher to create files containing any desired variables, and it would be designed in such a way so that users would require no more programming knowledge than necessitated by the use of canned packages. The PSHP has chosen the last course of action, though the software is not yet completed.

The new files could then be used to support research into the relationship between individual behavior and the ecologocal setting by returning the historical actors to their relevant social context. Drawing on some of our research already conducted in intra-residential mobility, I would like to provide an example of how this approach works. Like most such studies, movement within the city was treated as a dichotomous dependent variable and the personal characteristics of movers and non-movers (e. g., age, occupation, birthplace, property holding, martial status) were used as independent variables. Using a multivariate approach that controls for the effect of highly intercorrelated independent variables, we were able to explain only ten percent of the observed variation in residential mobility. Such results pose serious problems in interpretation. Do the findings suggest that the decision to move is capricious? Or is it exceedingly complex, rooted in normative or psychological variables? Or is the explanation rooted in structural variables not included in the data set that describe the areas at both the origin and destination of the migration stream (e. g., the nature of the housing stock, the socioeconomic and demographic composition of the population, the availability of job opportunities, the presence of public services, institutions, and transportation facilities)?

When the new areal summary records are created, we will be in a position to answer these questions. First, both the new ecological files and those containing the individual „movers and stayers" will be sorted by areal unit. Next a computer program will add to the machine-readable record of each person the ecological data for their origin and destination points. Finally, the new files will be re-analyzed using the multivariate routines, but this time there will be a host of new and potentially highly significant independent variables to supplement the explanatory process.

Summary and Concluding Observations

The argument made in this essay is that collaborative interdisciplinary historical research is far easier to talk about than to operationalize successfully. Despite generations of praise and recommendations by countless scholars, active interdisciplinary research remains a goal, not an accomplishment. In the United States, structural factors – the system of hiring and rewards that govern the organization of research in institutions of higher learning – and cultural factors – that set of values that sanctify individual achievement while de-emphasizing collaborative effort – along with the non-applied uses of historical knowledge were offered as reasons why interdisciplinary efforts do not appear more frequently in American colleges and universities. A common data base of sufficient scope and detail was identified as a mechanism capable of supporting interdisciplinary research because it can facilitate the integration of effort by scholars from diverse social science backgrounds. Using the PSHP as a model for collaborative interdisciplinary historical research, we described the project's machine-readable data base, the kinds of analytic goals it supports, and several of the data manipulation strategies used to combine data sets thus enabling the attainment of analytic goals not possible when each information source was examined in isolation.

It is important to bear in mind that the shift in method and technique that characterizes the efforts of „new" historians does not constitute a new form of research organization. Individual, disciplinary-enclosed research can continue now as it has in the past with change characterizing only the particular approach and tools, not the overall *organization* of research. In fact, this is by and large what happened in the U. S. Much of the historical research done could have been substantially improved if undertaken along with scholars from other disciplines, or at least in cooperation with colleagues in the same discipline. Because this was not done, individual researchers used different coding and categorization schema, different measures and variable values, and different record linkage techniques, all of which introduce serious bias and confound comparisons across studies. What is more, research remains fragmented; studies of family structure proceed independent of

those on the life course; studies of mobility are conducted without consideration of family behavior; both undertaken without regard for environmental setting or the impact of technological innovation. Quantitative data and methods will not by themselves, in other words, realize the opportunities made available by the technologies that facilitate much of our new research.

In closing I would like to offer the following suggestions to scholars beginning to undertake the new historical research. Do not embark on the process of data collection and processing as individuals. The constraints imposed on single researchers by the time and costs involved will severely limit the range of analytic possibilities, or if you will, the choice of dependent and independent variables in the research design. Instead, convene conferences and invite scholars from all disciplines who are interested in the new historical research. Place highest on the agenda the identification of the kinds of data necessary to support diverse analytic goals and the greatest number of researchers. Collect 100 percent samples wherever possible so that the many unanticipated uses of the data can be sustained by primary as well as secondary and tertiary researchers. Convert the historical information to machine-readable form without collapsing it into comprehensive categories; use basic codes that maintain a one-to-one relationship with the raw information so that the data can be recoded by subsequent researchers.

Pool your resources. Establish local, regional and national research centers. These centers need not at the outset be tied together by a tightly structured central theoretical framework; although some will argue that this must precede rather than follow the collection of the data, something far looser will suffice to get things moving. It is unlikely, moreover, that any meaningful agreement will be reached at this initial stage of research. Subgroups of researchers will emerge and more rigorous theoretical frameworks will evolve as the analytic work progresses. It appears that the establishment of the QUANTUM organization in Germany and the SSHA in the U.S. constitute important beginning steps in this direction and it augurs well for the future of interdisciplinary collaborative historical research.

Appendix I

PSHP Research Associates (September, 1978)

Name	Discipline and Affiliation	Research Interest
Burstein, Alan	Assistant Professor, Sociology, Washington University	Intra-urban Migration and Demographic Patterns
Cohen, Jeffrey	Ph. D. Candidate, History of Art, University of Pa.	Architectural History
Condran, Gretchen	Visiting Assistant Professor, Demography, University of Pa.	Nineteenth-Century Mortality
Cox, Harold	Professor, History, Wilkes College	Inter- and Intra-Urban Transportation Systems
Crum, John	Ph. D. Candidate, History, University of Delaware	Municipal Services and the Development of Bureaucracy
Ericksen, Eugene	Associate Professor, Sociology, Temple University	Industry, Residence and Community Stability in 20th C. Philadelphia
Feinman, Jay	Assistant Professor, Law, Rutgers University, Camden	19th Century Legal History
Fishbane, Richard	Ph. D. Candidate, Education, University of Pennsylvania	19th Century Urban Education History
Frisch, Michael	Associate Professor, History, Suny, Buffalo	Comparative Urban History
Furstenberg, Frank	Associate Professor, Sociology, University of Pa.	Family Structure and Behavior
Gillette, Howard	Assistant Professor, Dir. Amer. Studies, Geo. Washington Univ.	Nineteenth-Century Urban Political History
Glassberg, Eudice	Associate Professor, Social Welfare, Temple University	Benevolent Societies and the Response to Poverty
Goldin, Claudia	Assistant Professor, Economics, Princeton University	Family and Female Labor Force Participation

Name	Discipline and Affiliation	Research Interest
Greenberg, Stephanie	Sociologist, Ctr. for Study of Social Behavior, Research Triangle Institute	Industrial Location and Residential Patterns
Greenfield, Richard	Political Science, PSHP	Urban Form and Political Organization
Griffis, Jim	Ph. D. Candidate, Sociology, Temple University	Industrialization and Class Relationships
Gruenstein, John	Ph. D. Candidate, Economics, U of P; Federal Reserve Bank	Econometric Model for the Location of Manufacturing
Haines, Michael	Assistant Professor, Economics, Cornell University	Fertility, Mortality, Work and the Life-Cycle
Holley, John	Ph. D., Sociology and History, University of Edinburgh	Family Structure and Work in 19th C. England and America
Kawaguchi, Leslie	Ph. D. Candidate, History, U. C. L. A.	Formation of the German-American Community
Lane, Angela	Post Doctoral Research, Sociology, Temple University	Occupational Mobility and Industrial Structure
Laurie, Bruce	Assistant Professor, History, University of Massachusetts	Occupational Structure and Labor History
Lautzenhiser, Renee	Ph. D. Candidate, Geography, Pennsylvania State University	Geographical Distribution of Municipal Services
Light, Dale	Ph. D. Candidate, History, University of Pennsylvania	The Formation of the Irish Community
Miller, Roger	Lecturer, Reg. Science and Urb. Studies, U. of Pa.	Application of „Time-Geography" to Nineteenth-Century Cities
Modell, John	Professor, History, University of Minnesota	Life Course Development and Urban Growth
Potman, Stephen	Assoc. Professor, City and Regional Planning, U. of Pa.	Work, Residence and Transportation Modelling
Roberts, Jeffrey	Ph. D. Candidate, History Temple University	Development of the Central District and Hist'l Geography

Name	Discipline and Affiliation	Research Interest
Rosenberg, Charles	Professor, History, University of Pennsylvania	19th Century Medical and Social History
Schmitz, Mark	Assistant Professor, Economics, University of Delaware	Manufacturing Productivity
Seaman, Jeffrey	Sociologist, PSHP and SPUP	Methodology, Statistics, Demography
Siry, Joseph	Ph. D. Candidate, Architecture, University of Pennsylvania	Suburban Housing Development and Architectural History
Steinberg, Allen	Ph. D. Candidate, History, Columbia University	Poverty and Criminality
Stolley, Paul	Professor, Research Medicine, University of Pennsylvania	Epidemiology and Mortality
Thomas, George	Architectural Historian	Architectural History
Ulle, Robert	Ph. D. Candidate, History, University of Pennsylvania	Culture and Institutions Among Black Philadelphians
Wallock, Leonard	Ph. D. Candidate, History, Columbia University	Artisans and Industrialization
Whitney, William	Lecturer, Economics, University of Pennsylvania	Location and Productivity of Manufacturing
Yancey, William	Associate Professor, Sociology, Temple University	Industry, Residence and Community Stability in 20th C. Philadelphia

Apendix II

PSHP Papers published and unpublished

Burstein, Alan N.,
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Patterns of Segregation and the Residential Experience, in: Historical Methods Newsletter, 9, No. 2–3 (March–June)*.

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Eisenhardt, Miriam, Sultanik, Jeffrey, and Berman, Alan,
The Five Irish Clusters in 1880 Philadelphia, May 1974.

Fishbane, Richard B.,
‚The Shallow Boast of Cheapness': Public School Teaching as a Profession in Philadelphia, 1865–1890, in: Pennsylvania Magazine of History and Biography, January 1979.

Furstenberg, Frank, Hershberg, Theodore, and Modell, John,
The Origins of the Female-Headed Black Family: The Impact of the Urban Environment, in: Journal of Interdisciplinary History, 6, No. 2 (September 1975). Reprinted in Staples, Robert (ed.), The Black Family: Essays and Studies, 2nd ed., Belmont/Calif. 1978*.

Furstenberg, Frank, Hershberg, Theodore, Modell, John, and Strong, Douglas,
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Gillette, Howard,
The Emergence of the Modern Metropolis: Philadelphia in the Age of Its Consolidation, in: Gillette, Howard, and Cutler, William (eds.), The Divided Metropolis: Social and Spatial Dimensions of Philadelphia 1820–1940, forthcoming 1979.

Glassberg, Eudice,
Work, Wages and the Cost of Living: Ethnic Differences and the Poverty Line, Philadelphia, 1880, in: Pennsylvania History, January 1979.

Goldin, Claudia,
Household and Market Production Functions in a Late-Nineteenth Century American City: Philadelphia, 1880, in: Explorations in Economic History (forthcoming).

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Family Strategies in Late-Nineteenth-Century Philadelphia*.

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The Relationship between Work and Residence in an Industrializing City: Philadelphia, 1880, in: Gillette, The Divided Metropolis.

Industrial Location and the Residential Patterns of Occupational Groups: Philadelphia, 1880, SSHA (November 1978).

Greenberg, Stephanie W., Hershberg, Theodore, Whitney, William, and Roberts, Jeffrey,
The Determinants and Dynamics of Intra-Urban Manufacturing Location: A Perspective on Nineteenth-Century Philadelphia, SSHA (November 1978)*.

Gruenstein, John,
Components of Manufacturing Location Change, 1850–1880, SSHA (1976).

Haines, Michael,
Poverty, Economic Stress and the Family in a Nineteenth-Century American City: Philadelphia, 1880*.

Hershberg, Theodore,
Free Blacks in Antebellum Philadelphia: A Study of Ex-Slaves, Free-Born and Socioeconomic Decline, in: Journal of Social History, 5, No. 2 (December 1971), pp. 183–209. Reprinted in Haller, Mark, and Davis, Alan (eds.), The Peoples of Philadelphia, 1973; Katz, Michael B. (ed.), Education and American Social History, New York 1973; Genovese, Eugene, and Miller, Elinor (eds.), Plantation, Town and County, Urbana 1974; and the Bobbs-Merrill Reprint Series in American History, Indianapolis 1973*.

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Greenberg, Stephanie,
Industrialization in Philadelphia: The Relationship Between Industrial Location and Residential Patterns, 1880–1930, Ph. D. Dissertation, Sociology, Temple University 1977.

Miller, Roger,
Time-Geographic Assessment of the Impact of Horse-Care Transportation in Philadelphia, 1850–1860, Ph. D. Disseration, Geography, University of California, Berkeley, 1979.

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Housing Philadelphians: The Relationship between Changing Architectural Types and Social and Spatial Differentiation, Architectural History, University of Pennsylvania.

Crum, John,
Development of Municipal Services in Nineteenth-Century Philadelphia, History, University of Delaware.

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Teachers in Transition: The Development of Public School Teaching as a Profession in Nineteenth-Century Philadelphia, Social Foundations of Education, University of Pennsylvania.

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The Germans in Philadelphia During the Nineteenth-Century, History, University of California, Los Angeles.

Lautzenhiser, Renee,
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The Evolution of the Irish Community in Philadelphia, 1850–1880, History, University of Pennsylvania.

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A Computerized Method of Determining Family Structure from Mid-Nineteenth Century Census Data (August 1972),

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The Evolution of the Source Conversion Process at the Philadelphia Social History Project (May 1974).

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Appendix III

Machine-Readable Data Describing Philadelphia County

I. Areal Unit

A grid pattern, with each unit one by one-and-one quarter blocks (660' X 775'), was imposed on the map of the entire county (130 square miles) producing ca.7,100 total grids.

All the machine-readable information identified below has been (or will be) coded for precise grid location; therefore it is possible to create an extensive set of variables for use in ecological analyses.

II. U.S. Population Manuscrupt Census Schedules: 1850, 1860, 1870, 1880

For the study of individuals and groups: Blacks: all persons (94,000); Irish: all males 18+ (142,000); Germans: all males 18+ (84,000); native-white-Americans: sample males 18+ (50,000). Longitudinal files (between-census linkages) of individual Black males and females, Irish males, and German males have been created.

For the study of family structure: 2,000 households, with ca. 6 persons per household for each ethnic group (Irish, German, native-white-American) in each census year. Total sample 144,000.

Variables for each of 500,000 individuals (differ slightly by census year): name, address, age, sex, race, color, occupation, real and personl property, place of birth, literacy, material status, school attendance.

For the study of neighborhood: Total population: 1850–408,000; 1860–565,000 1870–647,000; 1880–840,000. For each inhabitant of the 7,100 grid units, we record the age (8 categories), sex, and ethnicity (9 categories including 2nd generation in 1880).

III. Pennsylvania Abolition Society and Society of Friends Manuscript Census Schedules: 1838, 1847, 1856.

Data describes 11,500 households – all black households in Philadelphia County.

Variables for each household head and his household include (differ slightly by census year): name, sex, status-at-birth, occupation, wages, real and personal property, literacy, education, religion, membership in beneficial societies and temperance societies, taxes, rents, dwelling size.

IV. U.S. Manufacturing Manuscripts Census Schedules: 1850, 1860, 1870, 1880

Data describes ca. 29,000 individual firms (100% sample). Firms: 4,700 (1850); 8,500 (1880).

Variables: name of firm; type of product; amount of capital investment; type of power; type and number of machines; number of employees by sex; average wages paid by sex; number of months in operation each year; raw materials: kinds, quantities, values; finished products: kinds, quantities, values; and address and grid location.

V. City Business Directories: 1850, 1860, 1870, 1880
Data describes ca. 127,000 individual firms (100% sample). Firms: 10,000 (1850); 28,000 (1860); 39,000 (1870); 47,000 (1880).
Variables: name of subscriber; type of product or service; and address and grid location.

VI. Transportation Network: 1840–1880
Data describes a total of 150 routes including all forms of transportation: street, railways, railroads, trollexs, omnibuses.
Variables: date of incorporation; company name; date of merger; reconstruction of block-by-block routes and conversion of precise „X"-„Y" coordinates to machine-readable form.

VII. Mortality Register: July 1, 1880–June 30, 1881
Data describes ca. 19,000 individuals who died in Philadelphia during the twelve-month period following the Bureau of the Census (June, 1880) enumeration of the city's population .
Variables: name, color, sex, age, material status, date of death, cause of death, attending physician, occupation, birthplace, parent's names (if a minor), ward, address, place of burial.

VIII. Sewage Facilities: 1867–1885
Data includes the following variables: year of construction of sewer line; street; ward; dates of authorization, approval and final estimate; length; assessment; cost to city and property owners; builder; grid location.

IX. Institutions (public, private, secular, religious): 1850, 1860, 1870, 1880
Data describes 3,000 institutions.
Variables: name, year, type, address, grid location.

X. Voluntary Associations: 1820–1900
Data includes Black, Irish, and German individuals who were members of various Philadelphia organizations. Blacks: 3,200 individuals, 4,500 memberships, 200 organizations. Irish: 3,500 individuals, 6,000 memberships, 350 organizations. Germans: 2,500 individuals, 5,000 memberships, 200 organizations.
Variables: name, ethnicity, organization, position, year of membership.
In addition to this organizational data, our files include census information for those people we have linked to the four U.S. and three Quaker and Abolitionist censuses. To date, we have completed linkages for the Black associational members. Extensive lists for the Irish and German are in preparation; individual members will be linked to four U.S. Censuses.